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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,638	10/19/2001	David Patrick Magee	TI-32986	8619
23494	7590	03/20/2006	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED				JAMAL, ALEXANDER
P O BOX 655474, M/S 3999				ART UNIT
DALLAS, TX 75265				PAPER NUMBER
				2643

DATE MAILED: 03/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/044,638	MAGEE ET AL.	
	Examiner	Art Unit	
	Alexander Jamal	2643	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 09 January 2006.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 33-53 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date _____.

- 4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.
 5) Notice of Informal Patent Application (PTO-152)
 6) Other: _____.

DETAILED ACTION

Response to Amendment

1. Based upon the submitted amendment (1-9-2006), the examiner notes that claim 37 has been amended.
2. Examiner withdraws the objection to claim 37.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 33-53 rejected under 35 U.S.C. 103(a)** as being unpatentable over Youssefmir et al. (6795409) and further in view of Raleigh (6006110) and further in view of Paulraj et al. (6377636).

As per **claims 33,38,43**, Youssefmir discloses a communication system and associated method with data and training signals configured as shown in Fig. 5C, 5D (Col 25 lines 50-67, Col 26 lines 50-60). The system may use pilot tones sent with each data packet in order to determine weighting factors (for noise mitigation) for the base station (Col 27 lines 43-55). When training tones are used, the system inherently comprises a training tone extractor to extract training tones (first type of tones) from the received (by

a receiver) data signal (second type of tones). However, Youssefmir does not disclose the specifics of the antenna training including a noise estimator computing a noise estimation based on the training signals. Youssefmir further does not disclose that the training tones are indexed such that each training tone noise/channel estimate is used for it's nearest data tone noise/channel estimate.

Raleigh discloses a communications system using a blind adaptive technique to reduce interference and multipath fading (noise). Raleigh discloses that the technique may be used with training tones (a first type of tones) (Col 7 lines 40-47) to improve communication quality, and account for multipath fading (Col 3 lines 40-60). The system further comprises a noise estimator (Col 8 lines 35-45) to estimate the noise (SNR) of the received signals (Col 8 lines 10-25). The estimates are used by a beamformer (where the data comprises a second type of tones) (Col 5 line 50 to Col 6 line 8). It would have been obvious to one of ordinary skill in the art at the time of this application to implement Raleigh's noise reducing method for the purpose of improving communication quality, and accounting for multipath fading.

Paulraj discloses a beamforming system that uses training tones to estimate the noise of each channel (channel estimates) in order to use that noise estimate for the corresponding data tone in that channel (Col 10 lines 4-14). The system may transmit the both the data and training tones together (Col 13 lines 33-61). In this embodiment the system inherently comprises an indexing function that uses the noise estimate of the nearest training tone to each data tone for the purpose that the correct channel estimate (with each channel comprising a training tone and it's nearest data tones) be used for

each data tone. It would have been obvious to one of ordinary skill in the art at the time of this application to utilize the training tone nearest each data tone for the noise estimate for the purpose of improving communication quality by the fact that the nearest training tone will supply the most accurate channel estimate for each data tone.

As per **claim 51**, claim rejected for same reasons as claim 33 rejection.

Additionally, Youssefmir discloses antennas (Fig. 1). The system further comprises antenna 56 (RALEIGH: Fig. 3) and the means to convert the received antenna signal into a digital signal in the frequency domain (RALEIGH: Col 6 lines 30-45, Col 11 lines 15-30, note the phase term in line 22). Additionally, Youssefmir's system may be an FDMA or FDD system (YOUSSEFMIR: Col 28 lines 35-40), and Fig. 5D discloses that the training tone signals are fewer in number than the data signals.

As per **claims 34,39**, the noise estimator computes the difference (error signal) between a received training signal and a previous training signal (RALEIGH: Col 15 lines 25-40). The system calculates the variance and covariance (first and second indications) (RALEIGH: Col 11 lines 40-56). The system time averages the covariance (RALEIGH: Col 15 lines 1-10).

As per **claims 35,40,45**, claim rejected for same reasons as claim 51 rejection.

As per **claims 36,41,46**, claim rejected for same reasons as claim 51 rejection.

The system uses the noise indication, and channel estimates (via inputs) in a beamforming system (RALEIGH: Col 6 lines 45-65).

As per **claims 37,42,47**, the system calculates soft decisions and noise to signal (SINR) for each of the tones (RALEIGH: Col 14 lines 10-21).

As per **claim 44**, claim rejected for same reasons as claim 34 and 36 rejections.

As per **claims 48,49**, Raleigh discloses that the transmit and receive channels may be implemented as an application specific integrated circuit (special purpose dsp) (Col 6 lines 1-10). A DSP inherently comprises executable instructions (software) for the purpose of controlling the DSP.

As per **claim 50**, claim rejected for same reasons as claim 51 rejection.

As per **claim 52**, claim rejected for same reasons as claim 51 rejection.

As per **claim 53**, claim rejected for same reasons as claim 36 rejection.

Response to Arguments

5. Applicant's arguments filed 1-9-2006 have been fully considered but they are not persuasive.

As per applicant's argument that Paulraj does not disclose using training tones adjacent data tones to perform channel estimates (remarks pages 8,9), examiner disagrees. Paulraj discloses that the training tones may be a dedicated set or may be transmitted with the data (Col 13 lines 40-43). This is disclosed in more detail in Figs.

5a,5b (Col 8 lines 25-50, Col 9 lines 3-15). Each data tone D1,D2,D3 has an associated training tone tr1,tr2,tr3.

As per applicant's argument that Paulraj does not disclose an indexing function (remarks page 9), examiner disagrees. Paulraj discloses that the training and data signals are coherently decoded (Col 9 lines 1-20), which requires an indexing function.

As per applicant's argument that Raleigh and Paulraj are not analogous and no motivation to combine exists, the examiner disagrees. Raleigh provides a specific method of improving channel characteristics comprising using previous measurements, variance, and correlation. Raleigh further discloses that the training may be used with training tones. Paulraj discloses a communication system where training tones may be sent with each data tone (Figs. 5a,5b). Examiner contends that both systems are communication systems directed towards improving received signal quality and examiner further contends that one skilled in the art would know to look to many communication systems (specifically mobile communication systems) for teachings. The motivation to combine the references is that Paulraj teaches an effective method of utilizing training tones (by sending them with each data tone), and there is further motivation to combine the references in the fact that Raleigh discloses that training signals (Col 7 lines 40-47) may be used in the system.

As per applicant's argument that Raleigh does not disclose the steps of claims 34 and 39 (remarks page 9), examiner disagrees. Raleigh discloses the steps of comparing (finding the difference or variance) of a current signal with a previous signal and additionally finding the correlation (covariance) of that signal. The results are also

averaged over time (Raleigh: Col 15 lines 15-40). Raleigh uses the covariance measurement to indicate the variance and correlation of a signal (Col 15 lines 30-35).

The covariance depends on the error term from equation 16 (Col 13 line 25). The equation 16 comprises a variance or difference between a burst of data and a previous burst of data.

As per applicant's arguments that claim 51 does not disclose the elements of claims 36,41,46, examiner disagrees. The claim 51 rejection referred to the claim 33 rejection, which disclosed the indexing function. Additionally, the rejection cites that Raleigh's system uses the noise indication, and channel estimates (via inputs) in a beamforming system (RALEIGH: Col 6 lines 45-65). Examiner further contends that the means disclosed in the claim 51 rejection (and the claim 33 rejection) will perform the method of applicant's claim 36.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 571-272-7498. The examiner can normally be reached on M-F 9AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 571-272-7499. The fax phone numbers for the organization where this application or proceeding is assigned are **571-273-8300** for regular communications and **571-273-8300** for After Final communications.

AJ
March 15, 2006


CURTIS A. KUNTZ
SUPPLEMENTAL EXAMINER
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